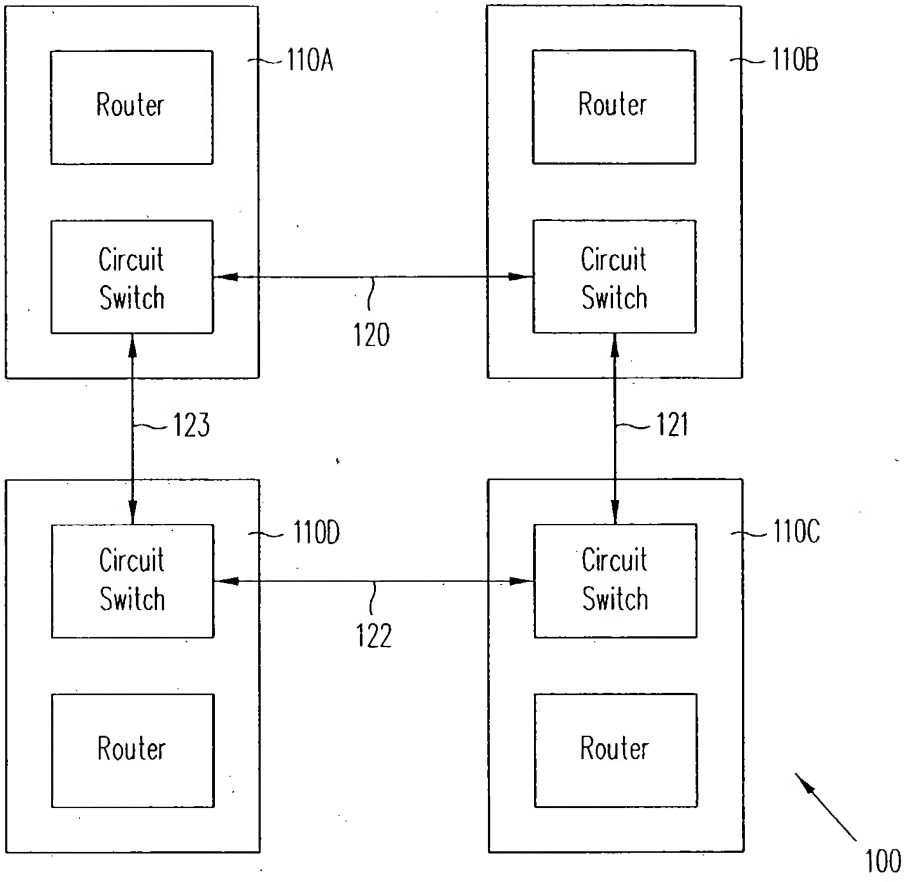
Router
110A
Router
110B
Circuit Switch
Circuit Switch
120
123
121
110D
Circuit Switch
Circuit Switch
110C
122
Router
Router
100

FIG. 1

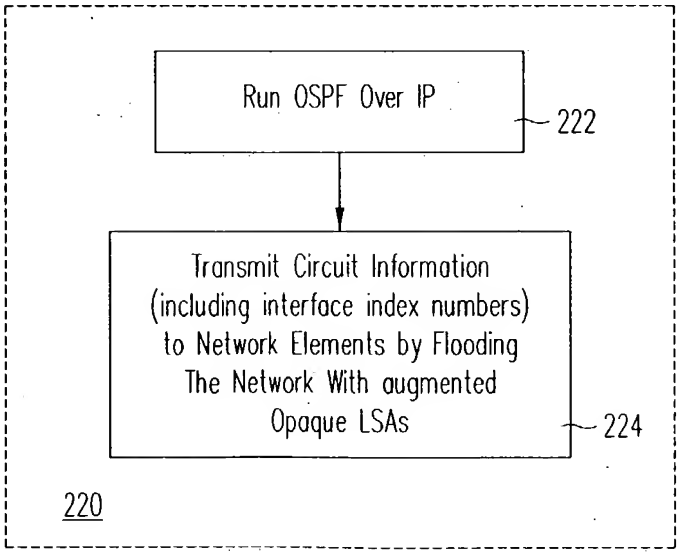
Run OSPF Over IP
222
Transmit Circuit Information (including interface index numbers) to Network Elements by Flooding The Network With augmented Opaque LSAs
224
220

FIG. 2C

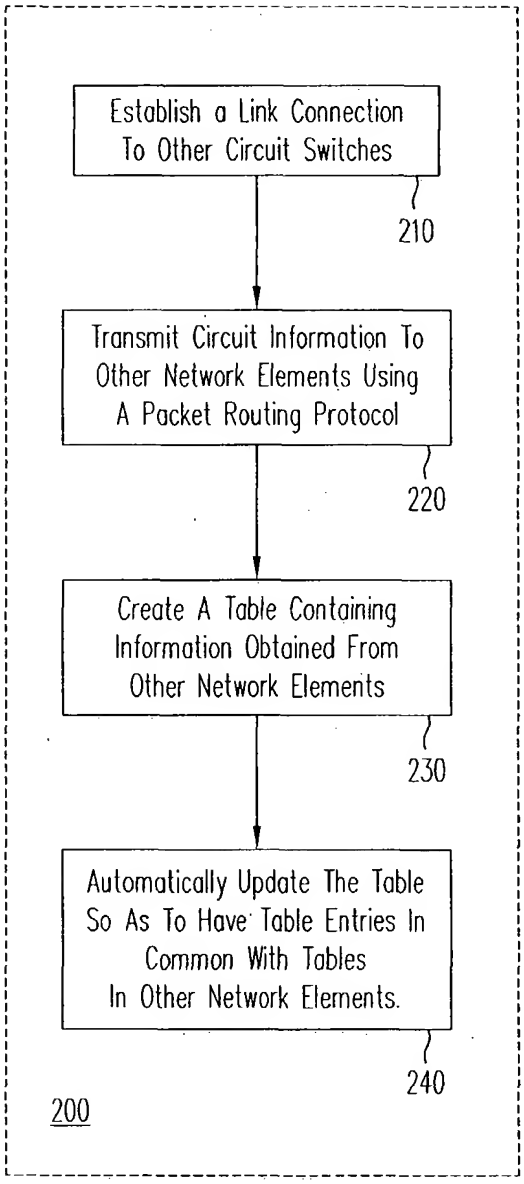
Establish a Link Connection To Other Circuit Switches
210
Transmit Circuit Information To Other Network Elements Using A Packet Routing Protocol
220
Create A Table Containing Information Obtained From Other Network Elements
230
Automatically Update The Table So As To Have Table Entries In Common With Tables In Other Network Elements.
240
200

FIG. 2A

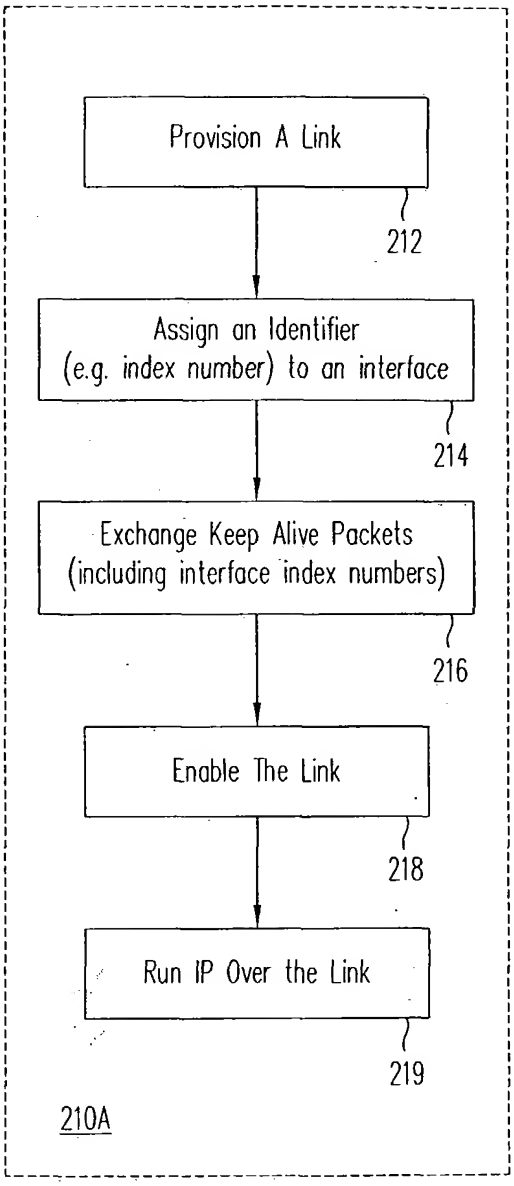
Provision A Link
212
Assign an Identifier (e.g. index number) to an interface
214
Exchange Keep Alive Packets (including interface index numbers)
216
Enable The Link
218
Run IP Over the Link
219
210A

FIG. 2B

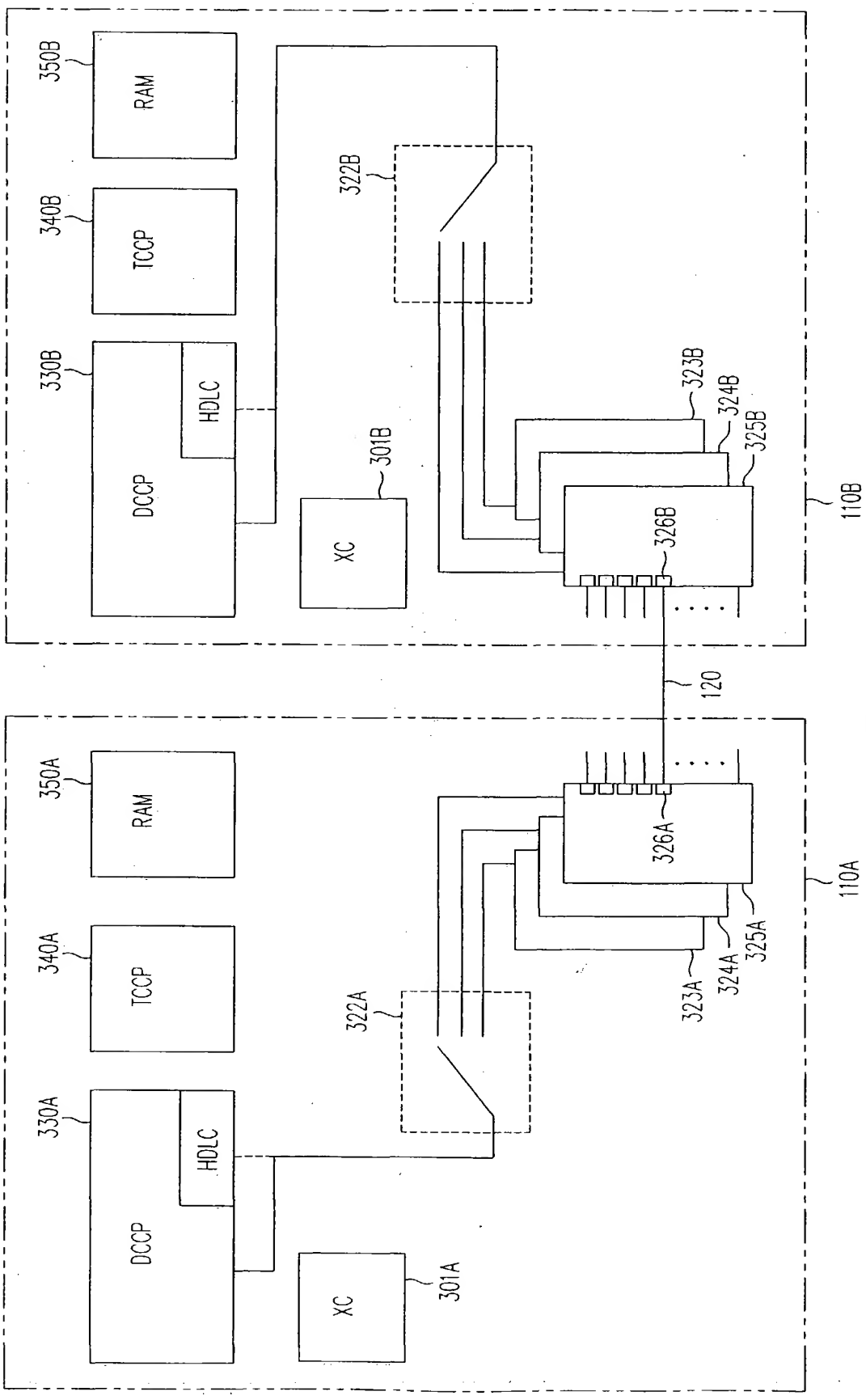
350B
RAM
340B
TCCP
330B
DCCP
HDLC
322B
301B
XC
323B
324B
325B
326B
110B
120
350A
RAM
340A
TCCP
330A
DCCP
HDLC
322A
301A
XC
326A
325A
324A
323A
110A

FIG. 3A

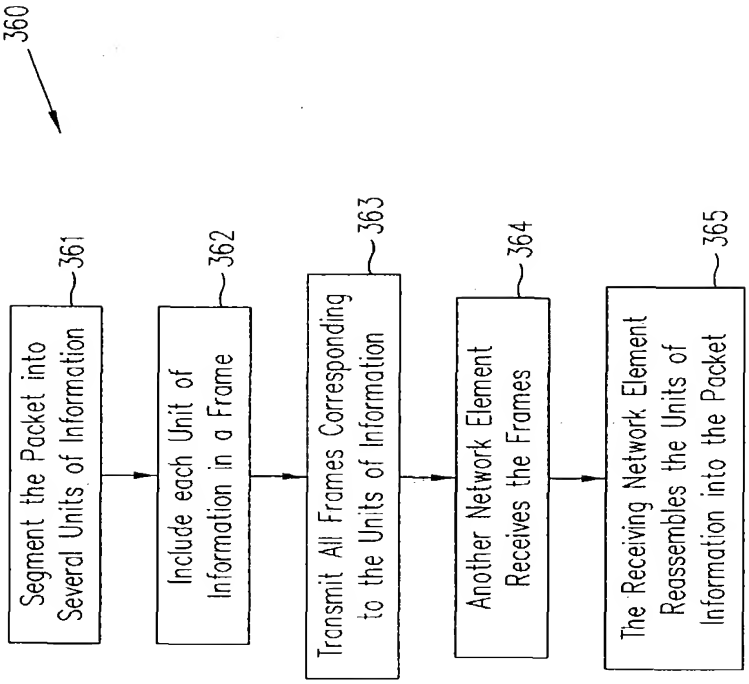
360
Segment the Packet into Several Units of Information
361
Include each Unit of Information in a Frame
362
Transmit All Frames Corresponding to the Units of Information
363
Another Network Element Receives the Frames
364
The Receiving Network Element Reassembles the Units of Information into the Packet
365

FIG. 3B

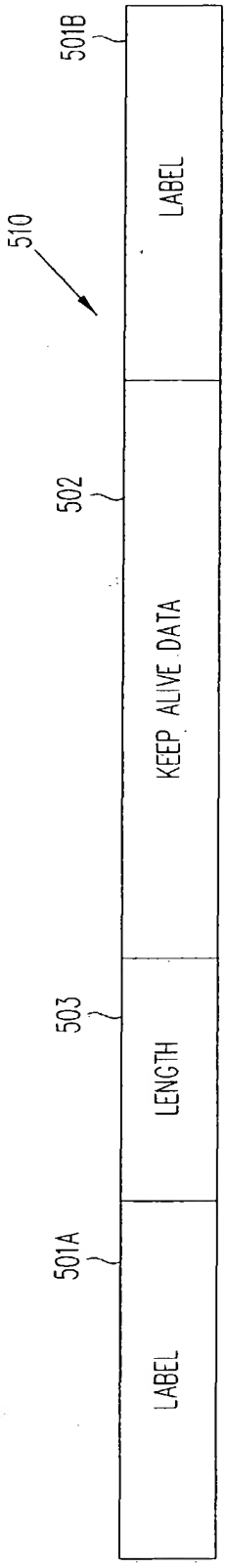
510
501B
LABEL
502
KEEP ALIVE DATA
503
LENGTH
501A
LABEL

FIG. 4

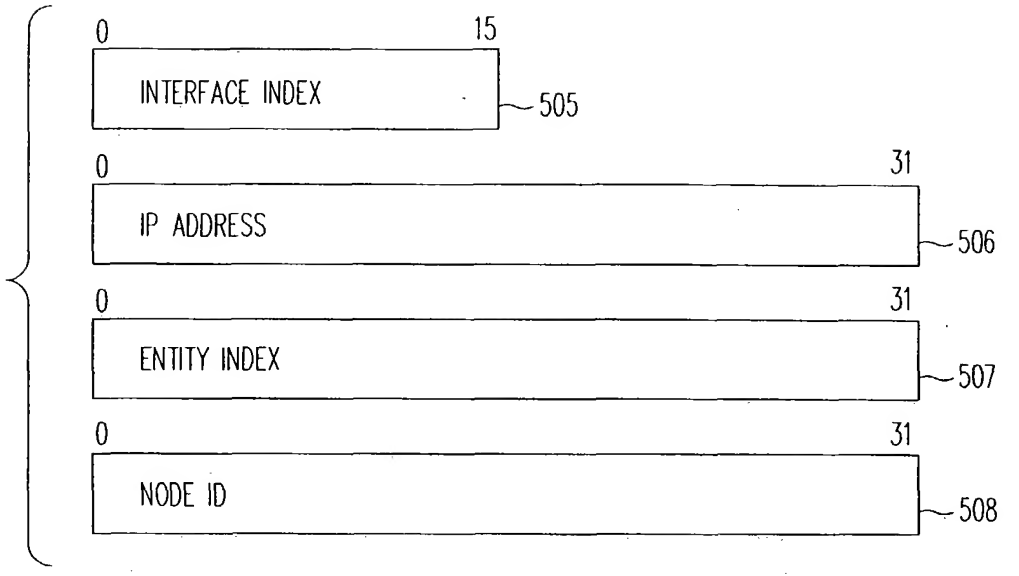
0
15
INTERFACE INDEX
505
0
31
IP ADDRESS
506
0
31
ENTITY INDEX
507
0
31
NODE ID
508

FIG. 5

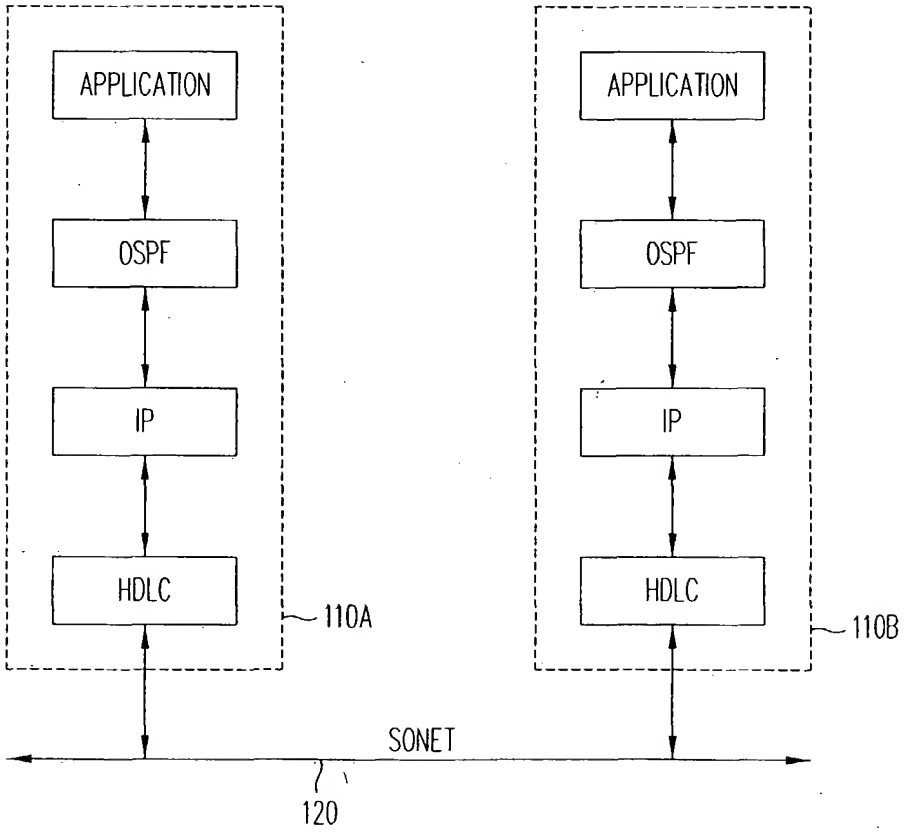
APPLICATION
OSPF
IP
HDLC
110A
APPLICATION
OSPF
IP
HDLC
110B
SONET
120

FIG. 6A

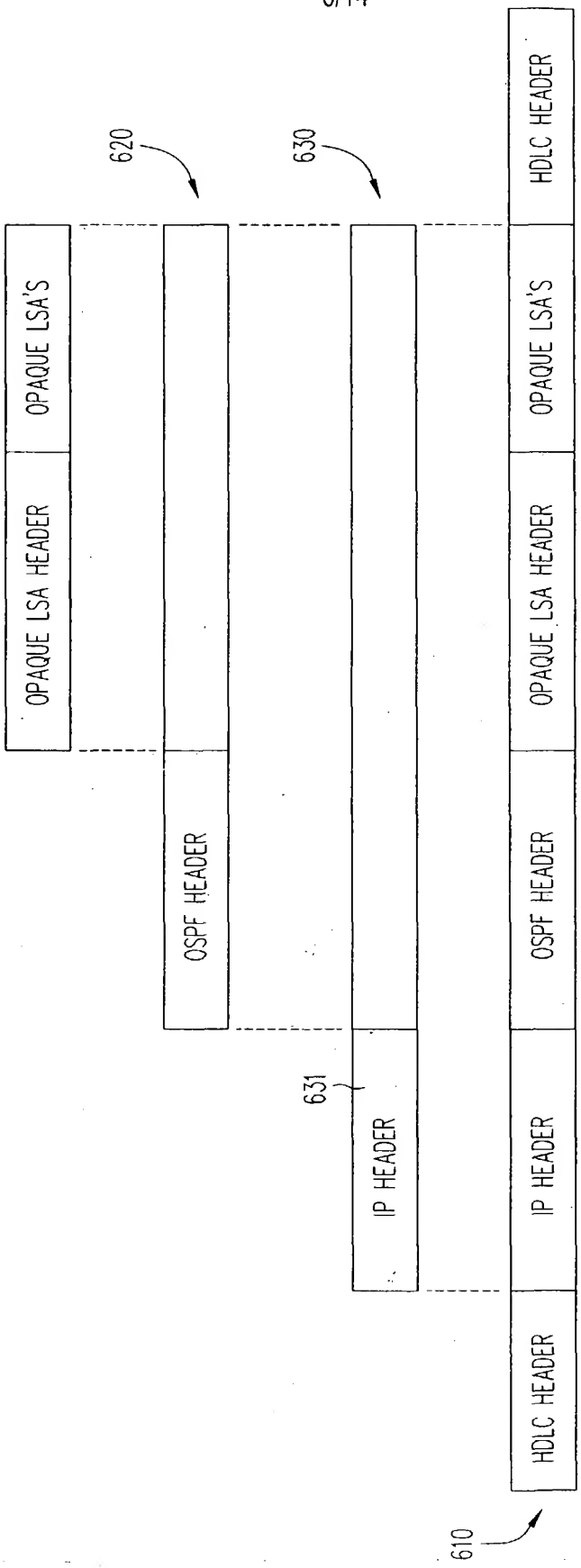
620
630
HDLC HEADER
OPAQUE LSA'S
OPAQUE LSA HEADER
OSPF HEADER
631
IP HEADER
610

FIG. 6B

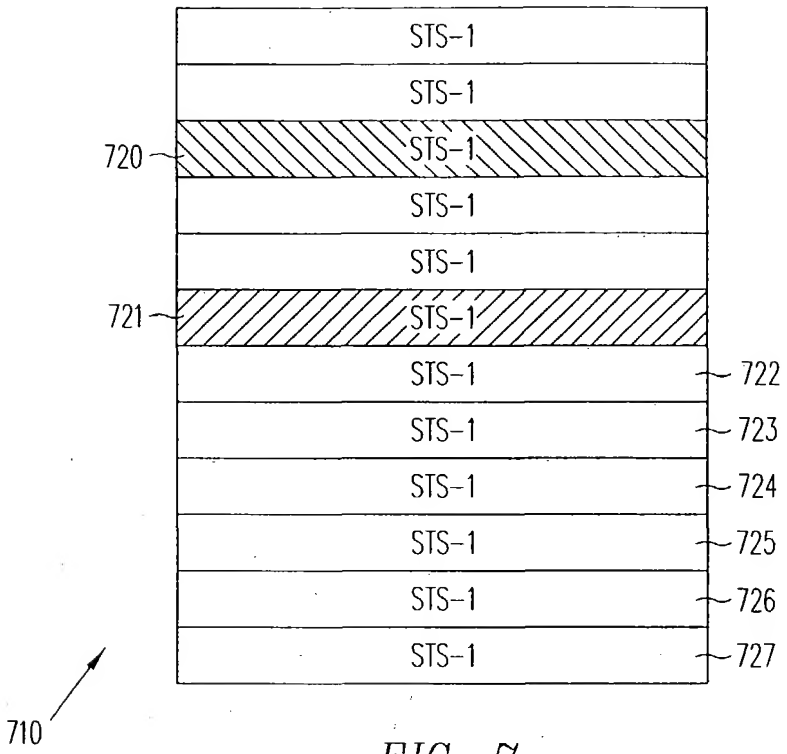
STS-1
STS-1
720
STS-1
STS-1
STS-1
721
STS-1
STS-1
722
STS-1
723
STS-1
724
STS-1
725
STS-1
726
STS-1
727
710

FIG. 7

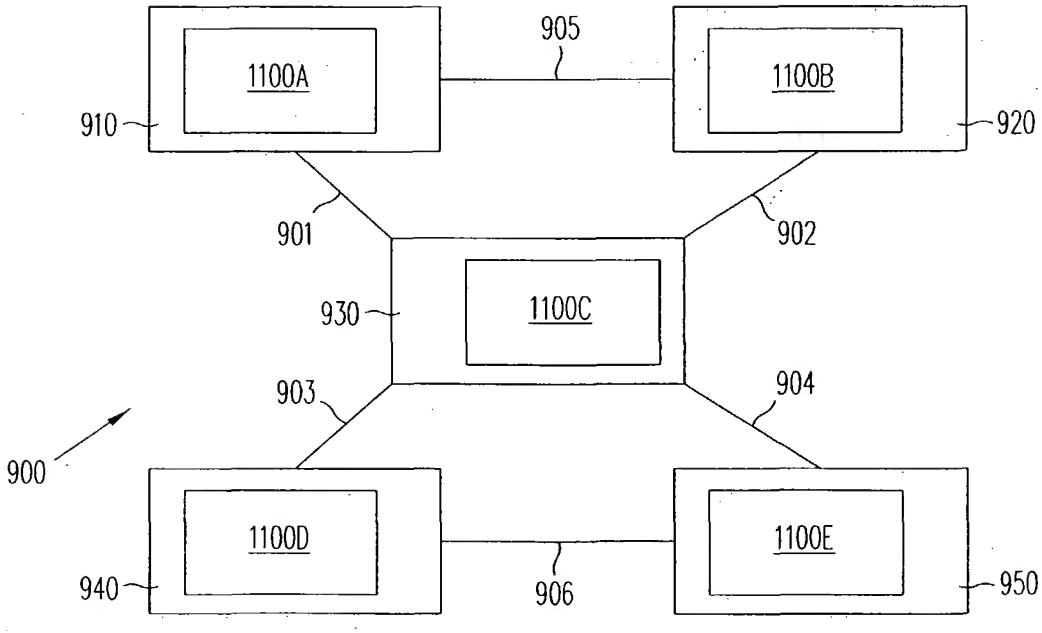
905
1100A
1100B
910
920
901
902
930
1100C
903
904
900
1100D
1100E
940
906
950

FIG. 11B

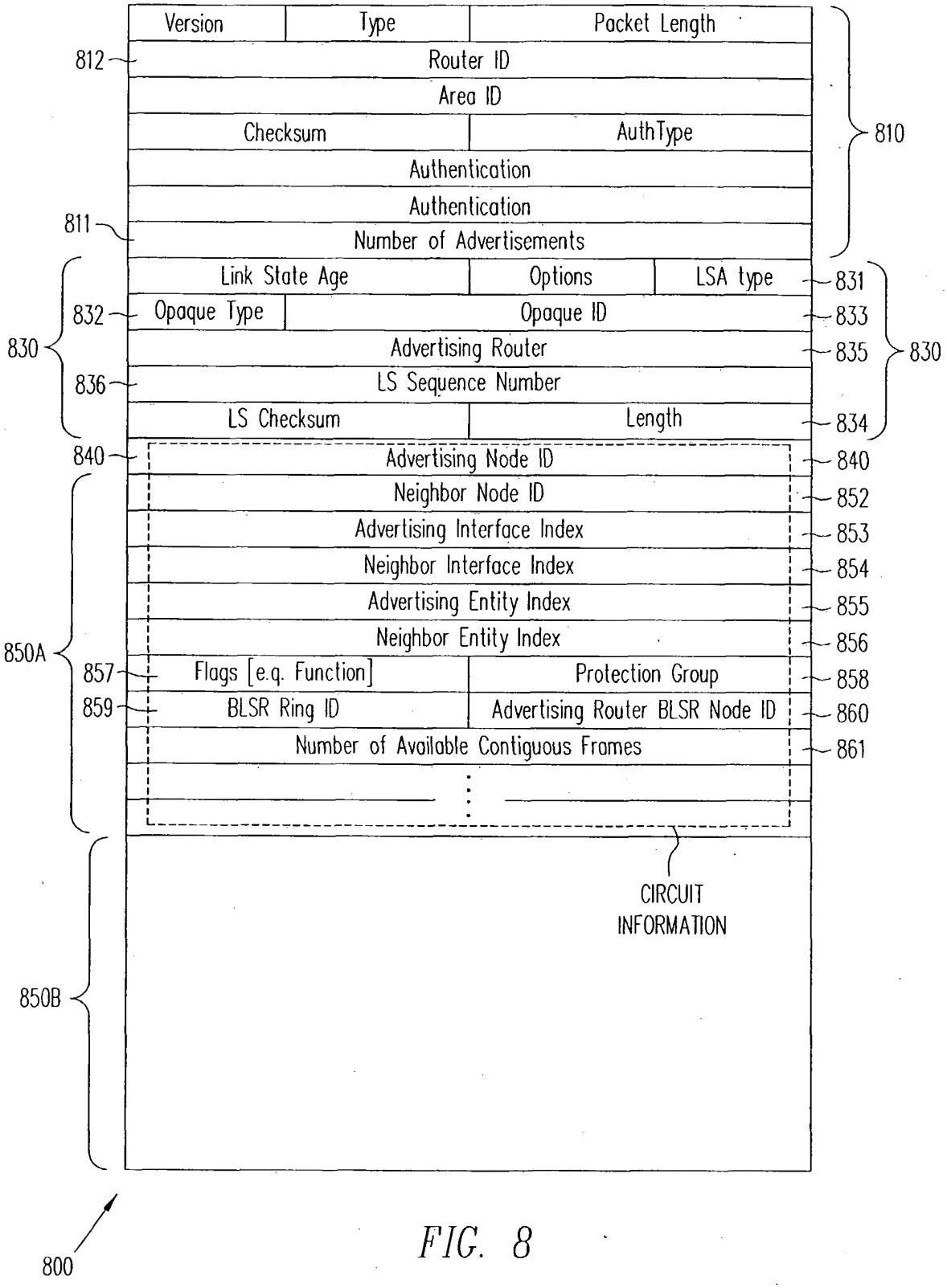
Version
Type
Packet Length
812
Router ID
Area ID
Checksum
AuthType
Authentication
Authentication
811
Number of Advertisements
810
Link State Age
Options
LSA type
831
832
Opaque Type
Opaque ID
833
830
Advertising Router
835
830
836
LS Sequence Number
LS Checksum
Length
834
840
Advertising Node ID
840
Neighbor Node ID
852
Advertising Interface Index
853
Neighbor Interface Index
854
Advertising Entity Index
855
Neighbor Entity Index
856
850A
857
Flags [e.g. Function]
Protection Group
858
859
BLSR Ring ID
Advertising Router BLSR Node ID
860
Number of Available Contiguous Frames
861
CIRCUIT INFORMATION
850B
800

FIG. 8

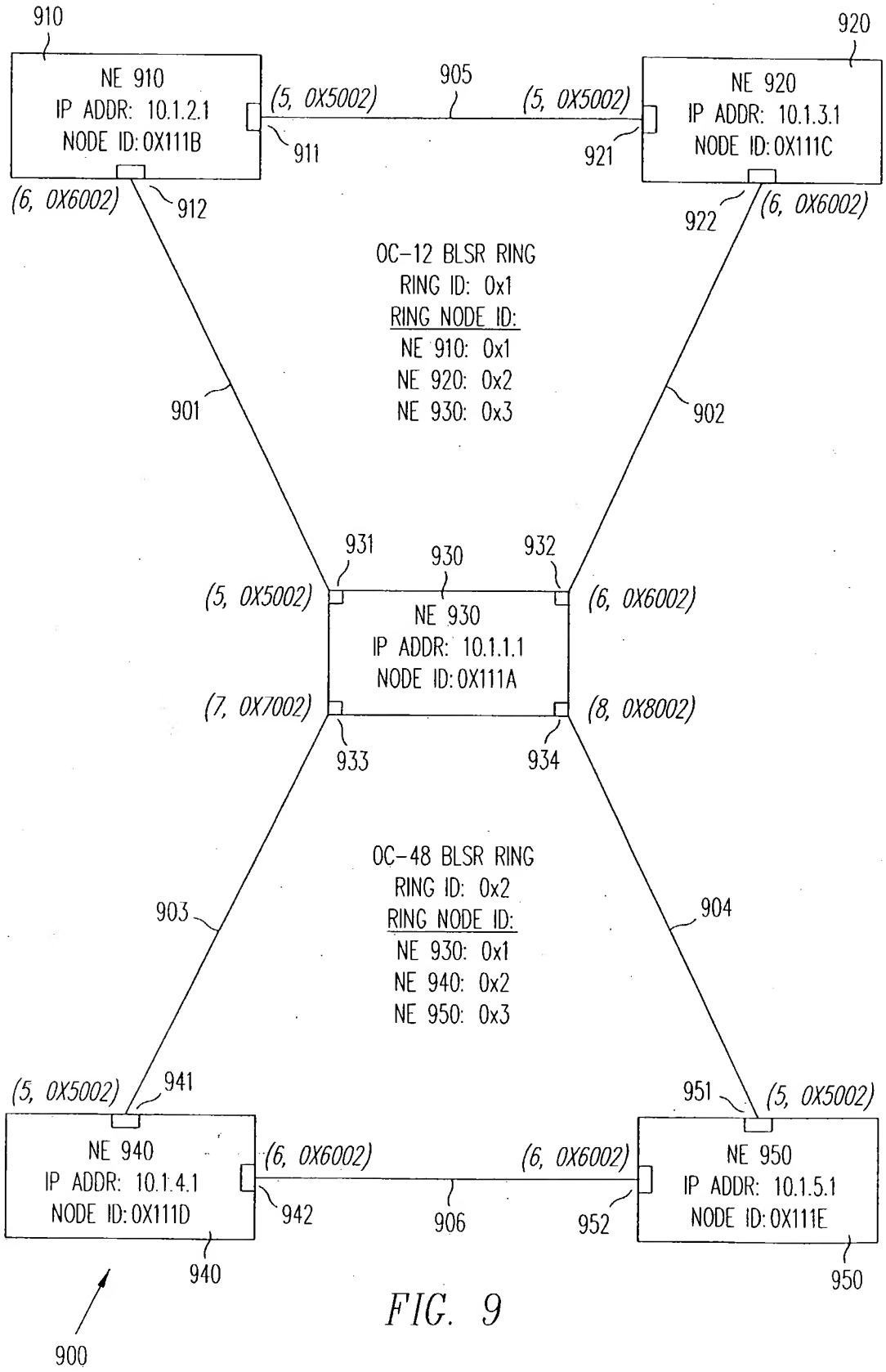
910
NE 910
IP ADDR: 10.1.2.1
NODE ID: 0X111B
(5, 0X5002)
911
905
(5, 0X5002)
921
920
NE 920
IP ADDR: 10.1.3.1
NODE ID: 0X111C
(6, 0X6002)
912
922
(6, 0X6002)
OC-12 BLSR RING
RING ID: 0x1
RING NODE ID:
NE 910: 0x1
NE 920: 0x2
NE 930: 0x3
901
902
931
930
932
(5, 0X5002)
NE 930
IP ADDR: 10.1.1.1
NODE ID: 0X111A
(6, 0X6002)
(7, 0X7002)
933
934
(8, 0X8002)
OC-48 BLSR RING
RING ID: 0x2
RING NODE ID:
NE 930: 0x1
NE 940: 0x2
NE 950: 0x3
903
904
(5, 0X5002)
941
951
(5, 0X5002)
NE 940
IP ADDR: 10.1.4.1
NODE ID: 0X111D
(6, 0X6002)
942
906
(6, 0X6002)
952
NE 950
IP ADDR: 10.1.5.1
NODE ID: 0X111E
940
950
900

FIG. 9

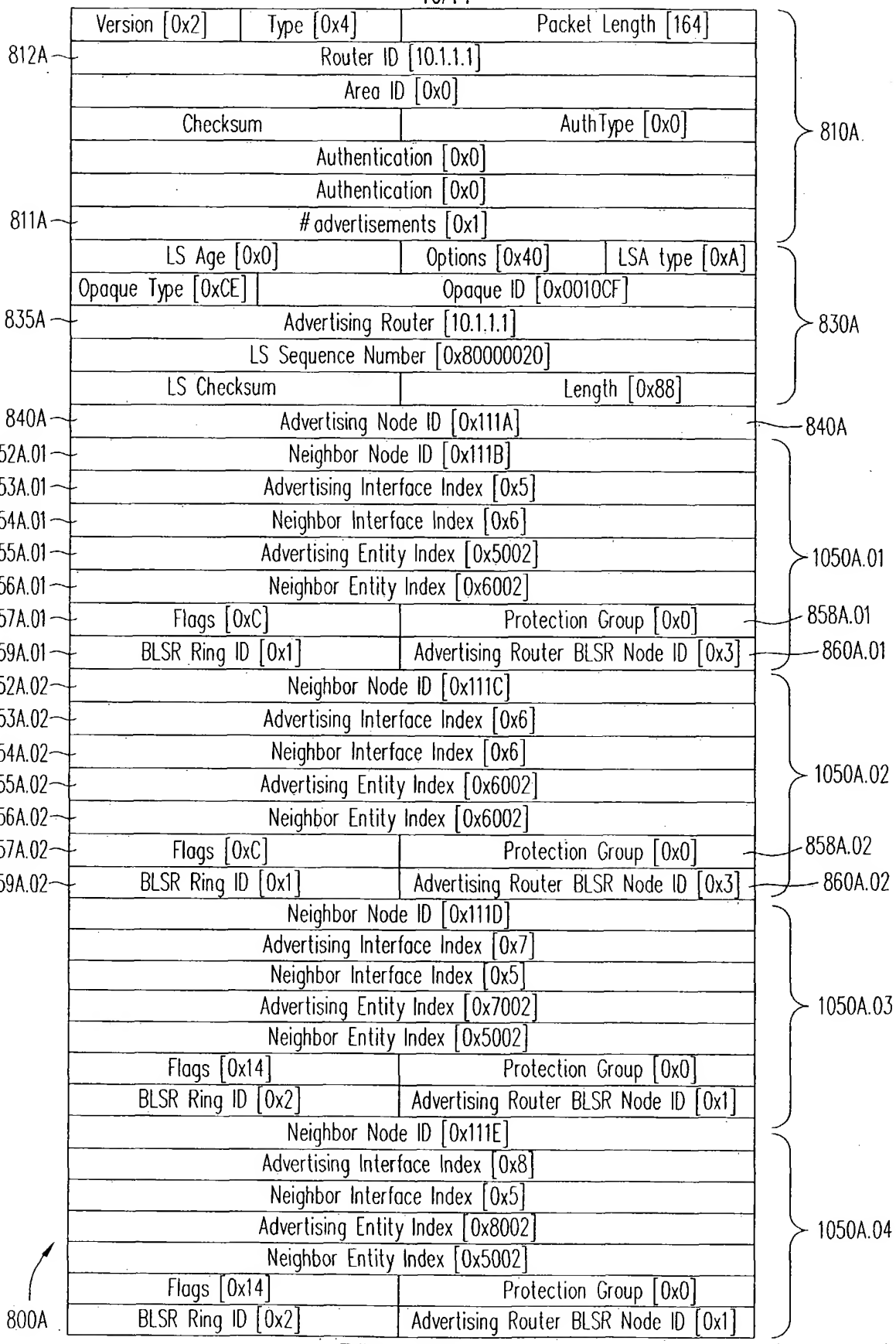
Version [0x2]
Type [0x4]
Packet Length [164]
812A
Router ID [10.1.1.1]
Area ID [0x0]
Checksum
AuthType [0x0]
Authentication [0x0]
Authentication [0x0]
811A
advertisements [0x1]
LS Age [0x0]
Options [0x40]
LSA type [0xA]
Opaque Type [0xCE]
Opaque ID [0x0010CF]
835A
Advertising Router [10.1.1.1]
LS Sequence Number [0x80000020]
LS Checksum
Length [0x88]
840A
Advertising Node ID [0x111A]
852A.01
Neighbor Node ID [0x111B]
853A.01
Advertising Interface Index [0x5]
854A.01
Neighbor Interface Index [0x6]
855A.01
Advertising Entity Index [0x5002]
856A.01
Neighbor Entity Index [0x6002]
857A.01
Flags [0xC]
Protection Group [0x0]
859A.01
BLSR Ring ID [0x1]
Advertising Router BLSR Node ID [0x3]
852A.02
Neighbor Node ID [0x111C]
853A.02
Advertising Interface Index [0x6]
854A.02
Neighbor Interface Index [0x6]
855A.02
Advertising Entity Index [0x6002]
856A.02
Neighbor Entity Index [0x6002]
857A.02
Flags [0xC]
Protection Group [0x0]
859A.02
BLSR Ring ID [0x1]
Advertising Router BLSR Node ID [0x3]
Neighbor Node ID [0x111D]
Advertising Interface Index [0x7]
Neighbor Interface Index [0x5]
Advertising Entity Index [0x7002]
Neighbor Entity Index [0x5002]
Flags [0x14]
Protection Group [0x0]
BLSR Ring ID [0x2]
Advertising Router BLSR Node ID [0x1]
Neighbor Node ID [0x111E]
Advertising Interface Index [0x8]
Neighbor Interface Index [0x5]
Advertising Entity Index [0x8002]
Neighbor Entity Index [0x5002]
Flags [0x14]
Protection Group [0x0]
800A
BLSR Ring ID [0x2]
Advertising Router BLSR Node ID [0x1]
810A
830A
840A
1050A.01
858A.01
860A.01
1050A.02
858A.02
860A.02
1050A.03
1050A.04

FIG. 10A

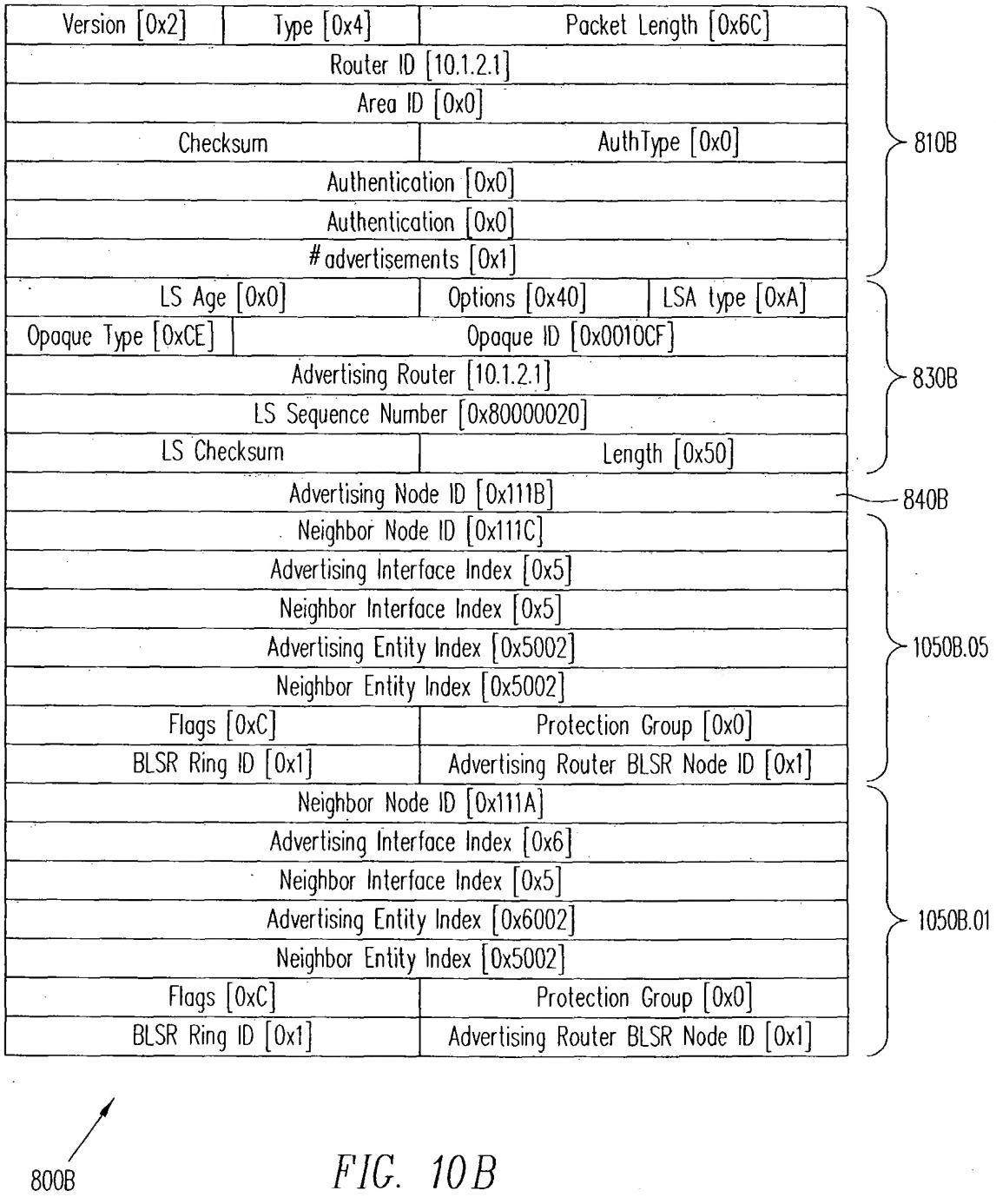
Version [0x2]
Type [0x4]
Packet Length [0x6C]
Router ID [10.1.2.1]
Area ID [0x0]
Checksum
AuthType [0x0]
Authentication [0x0]
Authentication [0x0]
advertisements [0x1]
810B
LS Age [0x0]
Options [0x40]
LSA type [0xA]
Opaque Type [0xCE]
Opaque ID [0x0010CF]
Advertising Router [10.1.2.1]
LS Sequence Number [0x80000020]
LS Checksum
Length [0x50]
830B
Advertising Node ID [0x111B]
840B
Neighbor Node ID [0x111C]
Advertising Interface Index [0x5]
Neighbor Interface Index [0x5]
Advertising Entity Index [0x5002]
Neighbor Entity Index [0x5002]
Flags [0xC]
Protection Group [0x0]
BLSR Ring ID [0x1]
Advertising Router BLSR Node ID [0x1]
1050B.05
Neighbor Node ID [0x111A]
Advertising Interface Index [0x6]
Neighbor Interface Index [0x5]
Advertising Entity Index [0x6002]
Neighbor Entity Index [0x5002]
Flags [0xC]
Protection Group [0x0]
BLSR Ring ID [0x1]
Advertising Router BLSR Node ID [0x1]
1050B.01
800B

FIG. 10B

Version [0x2]	Type [0x4]	Packet Length [0x6C]	810C
Router ID [10.1.5.1]			
Area ID [0x0]			
Checksum		AuthType [0x0]	
Authentication [0x0]			
Authentication [0x0]			
# advertisements [0x1]			
LS Age [0x0]	Options [0x40]	LSA type [0xA]	830C
Opaque Type [0xCE]	Opaque ID [0x0010CF]		
Advertising Router [10.1.5.1]			
LS Sequence Number [0X80000020]			
LS Checksum	Length [0x50]		
Advertising Node ID [0x111E]			840C
Neighbor Node ID [0x111A]			1050C.04
Advertising Interface Index [0x5]			
Neighbor Interface Index [0x8]			
Advertising Entity Index [0x5002]			
Neighbor Entity Index [0x8002]			
Flags [0x14]	Protection Group [0x0]		
BLSR Ring ID [0x2]	Advertising Router BLSR Node ID [0x3]		
Neighbor Node ID [0x111D]			1050C.01
Advertising Interface Index [0x6]			
Neighbor Interface Index [0x6]			
Advertising Entity Index [0x6002]			
Neighbor Entity Index [0x6002]			
Flags [0x14]	Protection Group [0x0]		
BLSR Ring ID [0x2]	Advertising Router BLSR Node ID [0x3]		

800C

FIG. 10C

1110A

1110B

1120

	NE-1 IP Address	NE-1 Node ID	NE-1 Interface Index	NE-1 Entity Index	NE-1 BLSR Ring Node ID	NE-2 IP Address	NE-2 Node ID	NE-2 Interface Index	NE-2 Entity Index	NE-2 BLSR Ring Node ID	Working or Protect	Link Type	BLSR Ring ID
1101	10.1.1.1	0x111A	0x5	0x5002	0x3	10.1.2.1	0x111B	0x6	0x6002	0x1	Working	OC-12	0x1
1102	10.1.1.1	0x111A	0x6	0x6002	0x3	10.1.3.1	0x111C	0x6	0x6002	0x2	Working	OC-12	0x1
1103	10.1.1.1	0x111A	0x7	0x7002	0x1	10.1.4.1	0x111D	0x5	0x5002	0x2	Working	OC-48	0x2
1104	10.1.1.1	0x111A	0x8	0x8002	0x1	10.1.5.1	0x111E	0x5	0x5002	0x3	Working	OC-48	0x2
1105	10.1.2.1	0x111B	0x5	0x5002	0x1	10.1.3.1	0x111C	0x5	0x5002	0x2	Working	OC-12	0x1
1106	10.1.4.1	0x111D	0x6	0x6002	0x2	10.1.5.1	0x111E	0x6	0x6002	0x3	Working	OC-48	0x2

1100

FIG. 11A

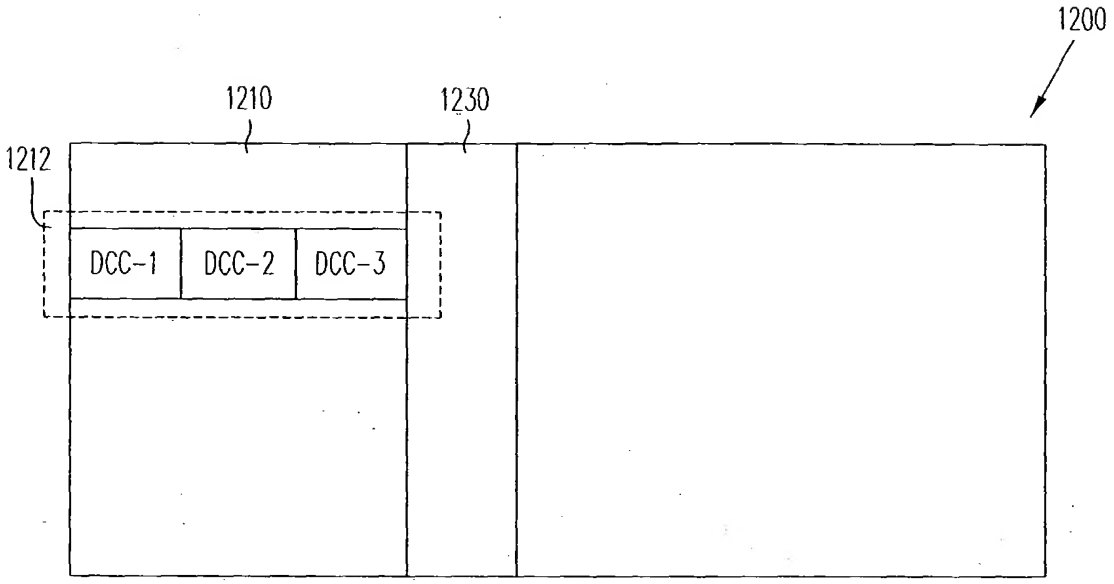

FIG. 12A

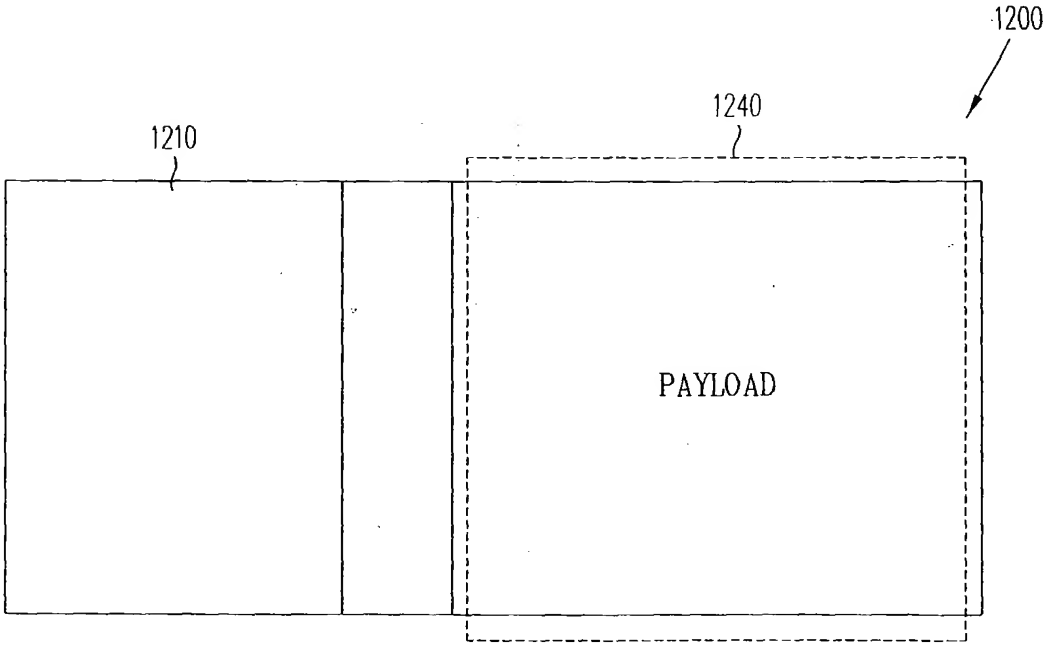

FIG. 12B